

Integrated Solar Energy Roofing Construction Panel

Annemarie H. Konold.

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I claim:

Claim 1 (currently amended): An improved solar collector panel for thermal radiant cooling and for simultaneously converting solar energy to electrical power and thermal energy comprising: a rectangular frame with an open top side and a bottom side closed by an aluminum bottom plate; a photovoltaic grid for converting solar energy transmitted into the collector into electrical energy; a thermal collecting/radiator sheet, located on a plane below the photovoltaic grid, for converting solar energy transmitted into the collector into thermal energy; a copper tubing heat exchanger containing a plurality of interconnected heat collecting copper tubes disposed on a plane below the thermal collecting/radiator sheet but conductively coupled to the sheet through a thermally conductive material that collects thermal energy from the sheet and imparts that thermal energy in a fluid disposed within the heat collecting copper tubes; a first waterproof, self-sealing, membrane with a top surface and an opposed bottom surface; a first adhesive layer in contact with the top surface of the first self-sealing, membrane forming an interface that is adhesively secured to the aluminum bottom plate of the collector by the first adhesive layer; a fluid temperature sensor whose signal is fed into a feedback flow controller providing a capability to control fluid discharge temperature and photovoltaic grid temperature to maintain the grids maximum operating efficiency; a water sprinkler head and control valve system disbursed throughout the solar panel array that receive on/off control signals through their connected wiring to facilitate roof cooling capability; wherein the improvement comprises:

- ~~(a) a first waterproof, self-sealing, membrane with a top surface and an opposed bottom surface;~~
- ~~(b) a first adhesive layer in contact with the top surface of the first self-sealing, membrane forming an interface that is adhesively secured to the aluminum bottom plate of the collector by the first adhesive layer;~~
- [[[b)]] (a) mounting screw guide tubes that extend the entire depth of the collector panel from the top of the frame through the aluminum bottom plate evenly disposed

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around each side of the collector frame for securing the panel to the embedment with fasteners whereby a collector panel positional/orientation adjustment capability is provided to allow minor adjustments of the solar panel to clear roof obstructions;

[[a)] (b) a separate insulated embedment component, with capability for factory pre-fabrication and designed for installation with standard construction techniques, that includes:

- a. a bottom layer made from standard building construction material as used for roof or deck sheathing with a top surface and an opposed bottom surface;
- b. a second waterproof, self-sealing, membrane with a top surface and an opposed bottom surface;
- c. a second adhesive layer in contact with the opposed bottom surface of the second waterproof, self-sealing, membrane that adhesively secures it to the building construction material top surface;
- d. a solid insulation board ,to provide thermal insulation, with a top surface and an opposed bottom surface, whose thickness is selected to satisfy applicable local building codes when required, placed with opposed bottom surface in contact with the top surface of the second waterproof, self-sealing, membrane;
- e. a second lap cement layer in contact with the exposed top surface of the solid insulation board; and
- f. a fiberglass and asphalt based sheathing with a top surface and an opposed bottom surface adhesively applied, opposed bottom surface down, to the second lap cement layer; and

[[g.]] (c) a first lap cement layer in contact with the top surface of the fiberglass and asphalt based sheathing for receiving and adhesively securing the collector panel by its first waterproof, self-sealing, membrane opposed bottom surface and secondly secured with fasteners placed through the mounting screw guide tubes.

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~~[[(e)]]~~ ~~(d)~~ copper quick connect fittings attached to the liquid inlet and outlet of each panel a fluid containing pipe with a plurality of outlets terminated in quick disconnect fittings, designed for factory pre-assembly, whereby fluids are distributed to and collected from solar panels connected to the outlets by quick disconnect fittings attached to each solar panel ;

~~(b)~~ copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings;

~~[[(g)]]~~ ~~(e)~~ a plastic raceway placed to receive electrical wiring from each panel or series panel string arranged in an array an enclosed wiring distribution scheme that includes a raceway with water tight quick-disconnect snap-on receptacles and plugs integrated within the raceway whereby assemblies can be factory prefabricated that provide the capability to electrically interconnect solar panels in a plurality of configurations to a power receiving apparatus;

~~[[(h)]]~~ quick connect snap in electrical connector plugs for the electrical interconnection of panels;

~~[[(i)]]~~ quick connect snap in electrical connector receptacles to connect panels or series strings of panels to the raceway;

~~[[(j)]]~~ ~~(f)~~ a rain runoff collection trough and storage apparatus connected to the lowest end of a slanted roof mounted solar panel or array of solar panels consisting of collection troughs, piping, in-line water filter for particulate removal, a storage tank for water storage and pressurization, check valves, and connection fittings to connect the apparatus to a building water distribution system; and

~~[[(k)]]~~ solenoid valves and sprinkler head units connected between rows of panels that —receive on/off control signals through their connected wiring; and

~~[[(l)]]~~ (g) an improved heat exchanger selected from the group consisting of: aluminum tubing heat exchanger; copper, thin-profile, water tank and aluminum, thin-profile, water tank.

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Claims 2-8 (canceled)

Claim 9(currently amended): An improved solar collector panel for thermal radiant cooling and for simultaneously converting solar energy to electrical power and thermal energy comprising: a rectangular frame with an open top side and a bottom side closed by an aluminum bottom plate; a thin-film photovoltaic grid vacuum deposited on a clear vinyl substrate for converting solar energy transmitted into the collector into electrical energy; a thermal collecting/radiator sheet, located on a plane below the thin-film photovoltaic grid, for converting solar energy transmitted into the collector into thermal energy; a copper tubing heat exchanger containing a plurality of interconnected heat collecting copper tubes disposed on a plane below the thermal collecting/radiator sheet but conductively coupled to the sheet through a thermally conductive material that collects thermal energy from the sheet and imparts that thermal energy in a fluid disposed within the heat collecting copper tubes; a first waterproof, self-sealing, membrane with a top surface and an opposed bottom surface; a first adhesive layer in contact with the top surface of the first self-sealing, membrane forming an interface that is adhesively secured to the aluminum bottom plate of the collector by the first adhesive layer; a fluid temperature sensor whose signal is fed into a feedback flow controller providing a capability to control fluid discharge temperature and photovoltaic grid temperature to maintain the grids maximum operating efficiency; a water sprinkler head and control valve system disbursed throughout the solar panel array that receive on/off control signals through their connected wiring to facilitate roof cooling capability; wherein the improvement comprises:

~~(c) a first waterproof, self sealing, membrane with a top surface and an opposed —bottom surface;~~

~~(d) a first adhesive layer in contact with the top surface of the first self sealing, —membrane forming an interface that is adhesively secured to the aluminum bottom —plate of the collector by the first adhesive layer;~~

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[[(b)]] (a) mounting screw guide tubes that extend the entire depth of the collector panel from the top of the frame through the aluminum bottom plate evenly disposed around each side of the collector frame for securing the panel to the embedment with fasteners whereby a collector panel positional/orientation adjustment capability is provided to allow minor adjustments of the solar panel to clear roof obstructions;

[[(a)]] (b) a separate insulated embedment component, with capability for factory pre-fabrication and designed for installation with standard construction techniques, that includes:

- a. a bottom layer made from standard building construction material as used for roof or deck sheathing with a top surface and an opposed bottom surface;
- b. a second waterproof, self-sealing, membrane with a top surface and an opposed bottom surface;
- c. a second adhesive layer in contact with the opposed bottom surface of the second waterproof, self-sealing, membrane that adhesively secures it to the building construction material top surface;
- d. a solid insulation board ,to provide thermal insulation, with a top surface and an opposed bottom surface, whose thickness is selected to satisfy applicable local building codes when required, placed with opposed bottom surface in contact with the top surface of the second waterproof, self-sealing, membrane;
- e. a second lap cement layer in contact with the exposed top surface of the solid insulation board; and
- f. a fiberglass and asphalt based sheathing with a top surface and an opposed bottom surface adhesively applied, opposed bottom surface down, to the second lap cement layer; and

[[(g.)]] (c) a first lap cement layer in contact with the top surface of the fiberglass and asphalt based sheathing for receiving and adhesively securing the collector panel by its

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first waterproof, self-sealing, membrane opposed bottom surface and secondly secured with fasteners placed through the mounting screw guide tubes.

~~[[(e)]]~~ ~~(d)~~ copper quick connect fittings attached to the liquid inlet and outlet of each panel a fluid containing pipe with a plurality of outlets terminated in quick disconnect fittings, designed for factory pre-assembly, whereby fluids are distributed to and collected from solar panels connected to the outlets by quick disconnect fittings attached to each solar panel ;

~~(e)~~ copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings;

~~[[(g)]]~~ ~~(e)~~ a plastic raceway placed to receive electrical wiring from each panel or series panel string arranged in an array an enclosed wiring distribution scheme that includes a raceway with water tight quick-disconnect snap-on receptacles and plugs integrated within the raceway whereby assemblies can be factory prefabricated that provide the capability to electrically interconnect solar panels in a plurality of configurations to a power receiving apparatus;

~~[[(h)]]~~ quick connect snap in electrical connector plugs for the electrical interconnection of panels;

~~[[(i)]]~~ quick connect snap in electrical connector receptacles to connect panels or series strings of panels to the raceway;

~~[[(j)]]~~ ~~(f)~~ a rain runoff collection trough and storage apparatus connected to the lowest end of a slanted roof mounted solar panel or array of solar panels consisting of collection troughs, piping, in-line water filter for particulate removal, a storage tank for water storage and pressurization, check valves, and connection fittings to connect the apparatus to a building water distribution system; and

~~[[(k)]]~~ solenoid valves and sprinkler head units connected between rows of panels that —receive on/off control signals through their connected wiring; and

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[[(1)]] (g) an improved heat exchanger selected from the group consisting of:
aluminum tubing heat exchanger; copper, thin-profile, water tank and aluminum, thin-profile, water tank.

Claims 10-16 (canceled)

Claim 17 (currently amended): An improved solar collector panel for thermal radiant cooling and for simultaneously converting solar energy to electrical power and thermal energy comprising: a rectangular frame with an open top side and a bottom side closed by an aluminum bottom plate; lens supports secured to the frame sides supporting Fresnel lenses that provide a passive solar tracking function; adjustable louvers mounted within the lens supports that provide a means to regulate air flow through the lens supports beneath the Fresnel lenses providing a capability to control lens surface temperature; a photovoltaic grid for converting solar energy transmitted into the collector into electrical energy; a thermal collecting/radiator sheet, located on a plane below the photovoltaic grid, for converting solar energy transmitted into the collector into thermal energy; a copper tubing heat exchanger containing a plurality of interconnected heat collecting copper tubes disposed on a plane below the thermal collecting/radiator sheet but conductively coupled to the sheet through a thermally conductive material that collects thermal energy from the sheet and imparts that thermal energy in a fluid disposed within the heat collecting copper tubes; a first waterproof, self-sealing, membrane with a top surface and an opposed bottom surface; a first adhesive layer in contact with the top surface of the first self-sealing, membrane forming an interface that is adhesively secured to the aluminum bottom plate of the collector by the first adhesive layer; a fluid temperature sensor whose signal is fed into a feedback flow controller providing a capability to control fluid discharge temperature and photovoltaic grid temperature to maintain the grids maximum operating efficiency; a water sprinkler head and control valve system disbursed throughout the solar panel array that receive on/off control signals through their connected wiring to facilitate roof cooling capability; wherein the improvement comprises:

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~~(e) a first waterproof, self sealing, membrane with a top surface and an opposed
—bottom surface;~~

~~(f) a first adhesive layer in contact with the top surface of the first self sealing,
—membrane forming an interface that is adhesively secured to the aluminum bottom
—plate of the collector by the first adhesive layer;~~

[[(b)] (a) mounting screw guide tubes that extend the entire depth of the collector panel from the top of the frame through the aluminum bottom plate evenly disposed around each side of the collector frame for securing the panel to the embedment with fasteners whereby a collector panel positional/orientation adjustment capability is provided to allow minor adjustments of the solar panel to clear roof obstructions;

[[(a)] (b) a separate insulated embedment component, with capability for factory pre-fabrication and designed for installation with standard construction techniques, that includes:

- a. a bottom layer made from standard building construction material as used for roof or deck sheathing with a top surface and an opposed bottom surface;
- b. a second waterproof, self-sealing, membrane with a top surface and an opposed bottom surface;
- c. a second adhesive layer in contact with the opposed bottom surface of the second waterproof, self-sealing, membrane that adhesively secures it to the building construction material top surface;
- d. a solid insulation board ,to provide thermal insulation, with a top surface and an opposed bottom surface, whose thickness is selected to satisfy applicable local building codes when required, placed with opposed bottom surface in contact with the top surface of the second waterproof, self-sealing, membrane;

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- e. a second lap cement layer in contact with the exposed top surface of the solid insulation board; and
- f. a fiberglass and asphalt based sheathing with a top surface and an opposed bottom surface adhesively applied, opposed bottom surface down, to the second lap cement layer; and .

[[g.]] (c) a first lap cement layer in contact with the top surface of the fiberglass and asphalt based sheathing for receiving and adhesively securing the collector panel by its first waterproof, self-sealing, membrane opposed bottom surface and secondly secured with fasteners placed through the mounting screw guide tubes.

[[c(e)]] ~~(d) copper quick connect fittings attached to the liquid inlet and outlet of each panel~~ a fluid containing pipe with a plurality of outlets terminated in quick disconnect fittings, designed for factory pre-assembly, whereby fluids are distributed to and collected from solar panels connected to the outlets by quick disconnect fittings attached to each solar panel ;

~~(d) copper pipe liquid connection manifolds for liquid distribution to and collection from panels arrays that are connected to the manifold by the copper quick connect fittings;~~

[[g]] (e) ~~a plastic raceway placed to receive electrical wiring from each panel or series panel string arranged in an array~~ an enclosed wiring distribution scheme that includes a raceway with water tight quick-disconnect snap-on receptacles and plugs integrated within the raceway whereby assemblies can be factory prefabricated that provide the capability to electrically interconnect solar panels in a plurality of configurations to a power receiving apparatus;

[[h]] ~~quick connect snap in electrical connector plugs for the electrical interconnection of panels;~~

[[i]] ~~quick connect snap in electrical connector receptacles to connect panels or series strings of panels to the raceway;~~

[[j]] (f) a rain runoff collection ~~trough~~ and storage apparatus connected to the lowest end of a slanted roof mounted solar panel or array of solar panels consisting of collection troughs, piping, in-line water filter for particulate removal, a storage tank for

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water storage and pressurization, check valves, and connection fittings to connect the apparatus to a building water distribution system; and

~~[[(k)]] solenoid valves and sprinkler head units connected between rows of panels that — receive on/off control signals through their connected wiring; and~~

[[(l)]] (g) an improved heat exchanger selected from the group consisting of: aluminum tubing heat exchanger; copper, thin-profile, water tank and aluminum, thin-profile, water tank.

Claims 18- 26 (canceled)